



# Defining the Pathway to the California Smart Grid

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## August 5, 2008

## Drivers for a Smart Grid



- Environment
  - Green House Gas
  - Foreign Oil Dependence



- Congress
  - EPACT 2005
  - EISA 2007



## Drivers for a Smart Grid



- GridWise Alliance

GridWise vision is new way to think about how we generate, distribute and use energy - using advanced communications and up-to-date information technology, GridWise will improve coordination between supply and demand, and enable a smarter, more efficient, secure and reliable electric power system.

- GridWise Architecture

Assemble ideas & resources to ensure interoperability

Leverage the GridWise interoperability framework as an organizing platform



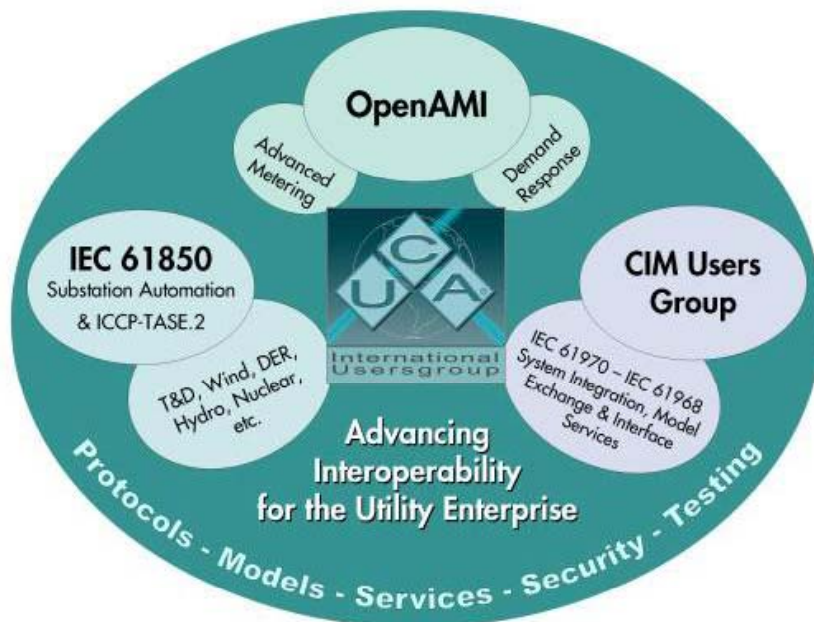
# Drivers for a Smart Grid



- OpenAMI
  - 200+ members
  - UtilityAMI
  - OpenHAN
  - OpenSEC



- Open AMI is a User Community affiliated with the UCA International Users Group, a non-profit organization whose members are utilities, vendors, and users of communications for utility automation.
- OpenAMI is represented by a Technical Subcommittee focused on OpenAMI issues, working in coordination with the UCAIUG Technical Subcommittees representing the IEC61850 and CIM users communities.
- The UCAIUG's UtilityAMI User Community provides the "High-Level Advanced Metering Infrastructure and Demand Response System Requirements Input & Oversight" to the OpenAMI Task Force.



# Smart Grid Stakeholders



## Policy & Regulation

- FERC
- PUC's
- NERC
- NARUC

## Government

- Federal
- State
- Local

## Utilities

- IOU's
- Publics
- RTO / ISO
- Power marketers



## Others

- EPRI
- Financial Firms
- R&D Organizations

## Vendors

- Technology
- Services

## Utility Consumers

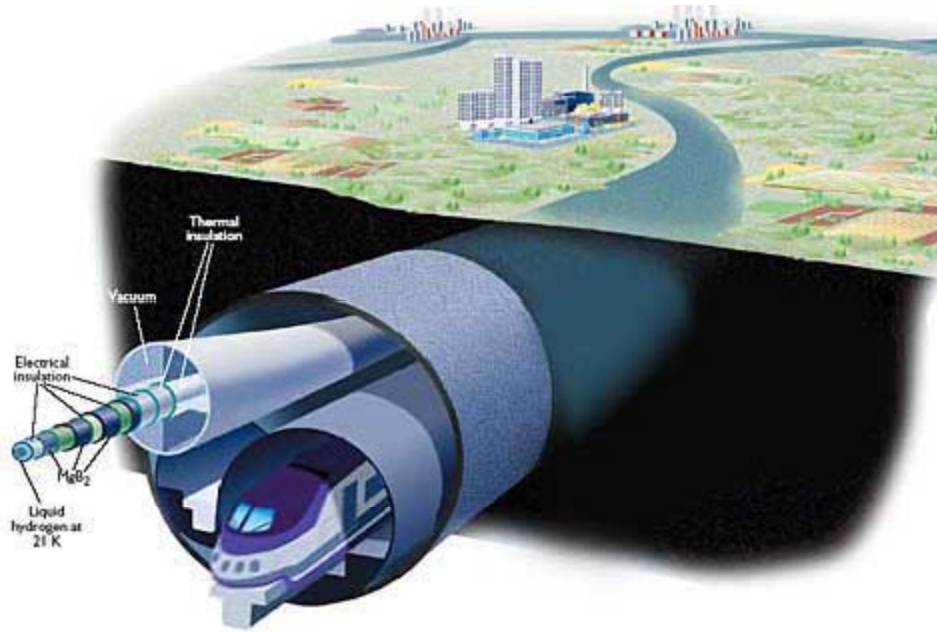
- Industrial
- Commercial
- Residential

## Advocacy

- EEI
- Rate Payer Groups
- Environmental Groups



# Pathway to the Future



- Demand Response
- Energy Efficiency
- Renewables
- Smart Generation
- Smart Grid

1. Smart Meters
2. IT + Operations Marriage
3. Business as usual





## A smart, integrated grid

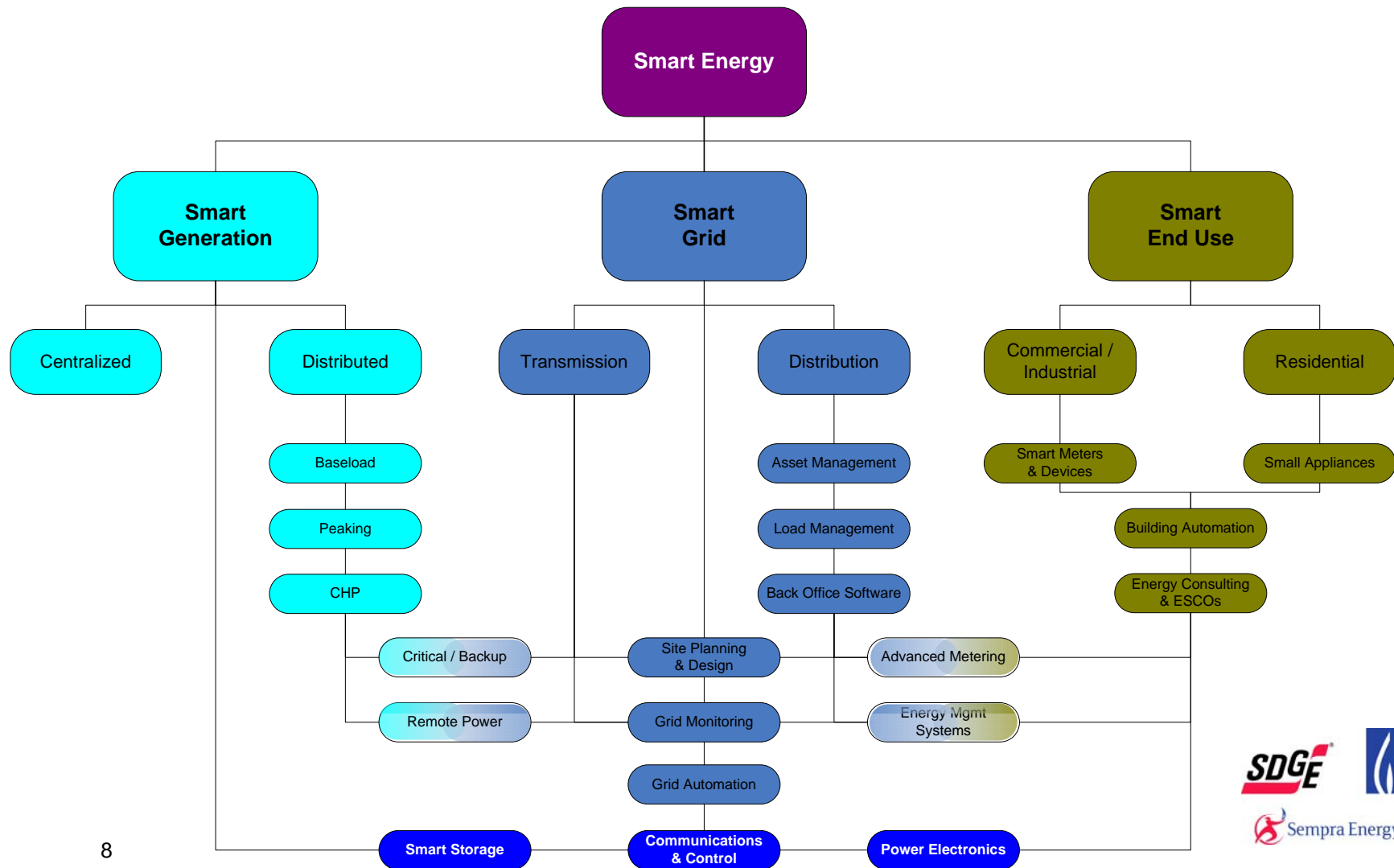


- Detects and fixes emerging problems
- Incorporates measurement, diagnostics and feedback
- Re-routes power flows
- Enables loads and distributed resources
- Incorporate advances in IT and communication technologies

# Elements of a Smart Grid



Computers, Electronics, Advanced Materials





## Systems View



- The “Systems View” perspective takes a holistic and objective approach to a subject, including technical, economic, regulatory, political, and societal aspects.
- It includes the complete recognition of the power system as one integrated machine having many interdependent parts.
- It recognizes that solutions can come from a wide and diverse range of sources.
- A “Systems View” also takes account of the full range of costs and benefits to society associated with the provision of reliable power.

# SDG&E Smart Grid Drivers / Challenges



- Aging Infrastructure
- Maturing Workforce
- Help Achieve / Integrate policy goals
  - Energy Action Plan Loading Order
  - Empower Consumers
- Potential Challenges
  - Cost
  - Complexity
  - Technology Advances

## SDG&E Vision



- Electric grid evolves to incorporate advances in many areas
- Ubiquitous communications
- New operational technologies
- New information technologies

# SDG&E Smart Grid Major Initiatives



- Advanced metering infrastructure
- Technologies improve operations
- Distribution automation
- Distributed generation with storage
- DOE and CEC funded Smart Grid Research

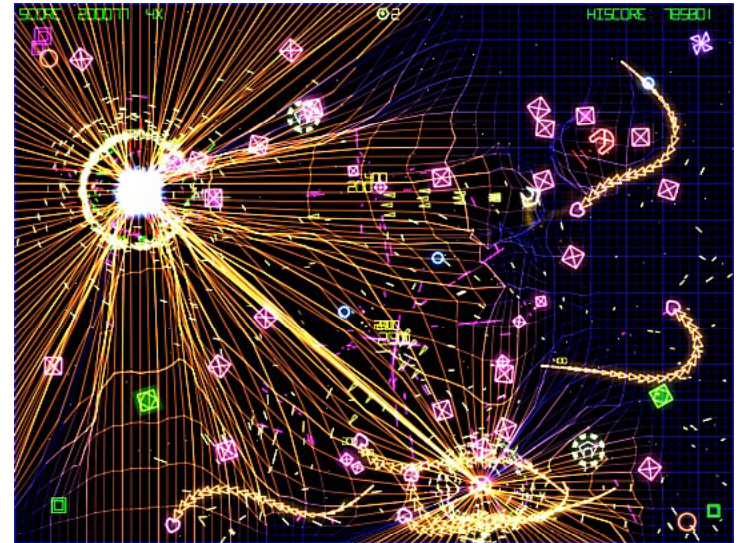




# Technology Research Gaps



- Advanced grid technologies
- Latest generation communication technologies
- State of the art grid state estimation
- State of the art operator visualization
- Advanced grid operations through devices, agents, controls, and distributed energy resources



# Summarize CEC PIER Recommendations



- Alignment of Smart Grid Vision: federal, state and industry
- Follow-through on foundational initiatives
- Roadmap for the future
  - Coordinate proceedings
  - Guidance to industry
  - RD&D for new technologies currently not cost effective
- Follow a top-down “systems” approach
- Ensure the use of standards for interoperability (e.g. Internet Protocol)
- Consider data privacy, confidentiality, possible NERC CIP
- Respect a need for broad stakeholder data interoperability
- Develop the next generation of DER, distributed monitoring and automation technologies
- Create regional projects
  - Include utility consumers
  - Evaluate storage technologies

Q/A

